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# Tobacco Cessation and the Impact of Tobacco Use on Oral Health

A Peer-Reviewed Publication

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## Educational Objectives

The overall goal of this course is to provide the reader with information on the impact of tobacco on oral health, and information on tobacco cessation.

Upon completion of this course the reader will be able to do the following:

1. List the types of tobacco and prevalence of use in the US population
2. Know the impact of tobacco use on oral and systemic health
3. Understand the biochemical and genetic factors associated with tobacco's impact on oral health
4. State the methods that can be recommended and that patients can engage in for tobacco cessation

## Abstract

Tobacco use continues to have a personal impact on individuals as well as having a public health impact. Tobacco use results in systemic conditions that include cardiovascular disease, lung disease, and numerous types of cancer, and is the single largest cause of death in the United States. With respect to oral health, it is associated with an increased risk of oral cancer and other mucosal lesions, periodontal disease, impaired healing, and caries. In addition, exposure to environmental smoke (secondhand smoke) is associated with oral and systemic diseases that include caries, cardiovascular and lung disease, and periodontal disease. Educating and advising patients on tobacco cessation, and referring them or implementing a program, helps patients stop using tobacco and improve their health.

## Introduction

Tobacco use continues to be prevalent globally in adults and teenagers. The use of tobacco impacts oral and systemic health; more recently, environmental smoke has been found to impact not only the systemic health of individuals exposed to it but also their oral health. Tobacco use is the single-largest cause of death in the United States, and is associated with significant morbidity and mortality, with a proven cause-and-effect relationship for a number of diseases. Tobacco can be smoked as cigarettes, cigars, or in pipes, while smokeless tobacco can be used as snuff or as chew (spit) tobacco, which is the more common variety. Snuff can be inhaled through the nose or taken dry, orally; however, the vast majority of users place moist snuff against the cheek in the vestibule of the mouth in the same manner that chew tobacco is used.<sup>1</sup> Cigarette smoking is responsible for about 20% of all deaths in the United States each year.<sup>2</sup> A stated goal of Healthy People 2010 is to reduce cigarette smoking to a prevalence of 12% in adults.<sup>3</sup>

**Cigarette smoking is responsible for about 20% of all deaths in the United States each year.**

## The Impact of Tobacco Use on Health

### Systemic Health

Tobacco use results in a greater risk of cancer, lung disease, and cardiovascular diseases. The statistics are overwhelming—almost 90% of lung cancer deaths in men and almost 80% in women, as well as between 80% and 90% of chronic obstructive pulmonary disease (COPD) deaths are caused by smoking tobacco.<sup>4</sup> Recent studies have shown that smokeless tobacco also increases the risk of cardiovascular disease; smokeless tobacco users have higher daytime heart rates than nonusers and have twice the risk of dying from cardiovascular disease. Unlike with smoking tobacco, however, no observed increase in atherosclerosis was observed.<sup>5</sup> A study of 2,840 adult males found that tobacco smokers and heavy smokeless tobacco users were both more than twice as likely as nonusers to suffer from hypercholesterolemia; for mild/moderate smokeless tobacco users, the risk increased 1.5 times.<sup>6</sup> Smokeless tobacco has also been found to be associated with pancreatic cancer.<sup>7</sup> Smoking tobacco has been linked to Alzheimer's disease,<sup>8</sup> and its use during pregnancy can result in complications that endanger both the mother and fetus.<sup>9,10</sup> Other effects of tobacco use include oxidative damage, increased inflammation, increased levels of inflammatory markers (including C-reactive protein), increased post-operative complications, an increased risk of gastric and duodenal ulcers, lower bone mass density in postmenopausal women, an increased risk of hip fractures in the elderly, as well as associations with erectile dysfunction, cataracts and age-related macular degeneration.<sup>11</sup>

**Smoking has been linked to Alzheimer's disease, and its use during pregnancy can endanger both the mother and fetus.**

Table 1. Systemic diseases and conditions

Heart disease — heart attacks, stroke, high blood pressure
Lung disease — cancer, COPD, chronic bronchitis, emphysema
Cancer — lung, oral, nasopharyngeal, esophageal, laryngeal, pancreatic, bladder, cervix, and other
Pregnancy complications — including low birth weight, miscarriage
Gastric and duodenal ulcers
Lower bone mass density
Increased risk of hip fractures
Post-operative complications

### Oral Health

Cigarette smoking and use of smokeless tobacco both result in oral lesions throughout the oral cavity and oropharynx. Oral cancer, leukoplakia, and other mucosal lesions that

include smoker's melanosis, keratotic patches, nicotinic stomatitis, and palatal erosions; periodontal disease; increased risk of tooth loss; and caries are all associated with tobacco use. There is also evidence of an association between maternal smoking during pregnancy and the development of cleft lip in the fetus.<sup>12,13,14</sup>

### Oral Malignancies and Other Mucosal Lesions

The risk of developing leukoplakia, oral malignancies and other oral mucosal lesions is substantially increased by tobacco smoking or the use of smokeless tobacco (Figure 1). Oral cancer risk for smokers is at least 6 times higher than for nonsmokers, and for chew/spit tobacco users the risk of cancer of the cheek and gingivae has been found to increase 50-fold over that of nonusers.<sup>15</sup> 75% of all oral cancer is related to tobacco use. Amongst cigar smokers there is a 7- to 10-fold increased risk of oral cancer, while for pipe smokers the risk is 2 to 3.5 times greater.<sup>16,17</sup>

Figure 1. Leukoplakia



Courtesy of National Cancer Institute

Cancer of the lip, with respect to tobacco use, is associated with pipe smoking.<sup>18</sup> The use of smokeless tobacco is associated with a higher prevalence of leukoplakia (a premalignant lesion) adjacent to the site of placement of the tobacco quid, and is correlated with the amount, frequency, type, and duration of smokeless tobacco use.<sup>19</sup> Since diagnosis of oral cancer more commonly occurs once the malignancy is non-localized, and the 5-year relative survival rate is just 59%, this, and the high morbidity with reduced quality of life as a result of the disease and treatment, have serious implications for the individual and for society.<sup>20</sup>

75% of all oral cancer is related to tobacco use.

### Periodontal Disease

Tobacco use is a significant acquired risk factor for periodontal attachment loss. Smokers experience more periodontitis and more severe periodontitis than do nonsmokers,<sup>21,22</sup> and in young people smoking is a risk factor for aggressive, destructive periodontal disease.<sup>23</sup> A study supporting the

rapid progression of periodontal disease in smokers was conducted in North Carolina, in adults age 65 and older, with smokers experiencing greater attachment loss over a 5-year period than did nonsmokers.<sup>24</sup> A prospective study with data from 810 subjects, starting when the subjects were age 15 in 1987 and ending at age 32, found that 48.9% had smoked. Among the long-term smokers, there was a 7-fold risk for at least 1 site with 5 mm or greater attachment loss; two-thirds of all new periodontal disease cases after the age of 26 were associated with smoking.<sup>25</sup> From NHANES III data and interviews on tobacco use (N = 12,329; dentate; 18 years or older), Tomar and Asma determined that 27.9% of people were smokers and 23.3% former smokers, and found that current smokers were 4 times more likely to have periodontitis than were nonsmokers; the likelihood of periodontitis increased with the number of cigarettes smoked. After adjusting for other risk factors (age, gender, SES, education, and race/ethnicity), they concluded that 41.9% of periodontal disease cases could be attributed to current smoking habits and 10.9% to former smoking habits. Periodontitis was correlated in 74.8% of cases with current smoking (1 or more site with clinical attachment level  $\geq 4$  mm apical to the cemento-enamel junction and a probing depth  $\geq 4$  mm).<sup>26</sup> Use of smokeless tobacco is also a significant factor in gingival recession and attachment loss (Figure 2).<sup>27,28</sup> Higher rates of peri-implantitis and implant failure have been found in smokers than in nonsmokers.<sup>29,30,31</sup>

Figure 2. Gingival recession associated with smokeless tobacco use



Courtesy of National Cancer Institute

### Impaired Healing and Tooth Loss

The response to periodontal therapy is less favorable in smokers than in nonsmokers and previous smokers, with lower reductions in pocket depths and poorer healing.<sup>32,33</sup> The smoking of tobacco (cigarette, cigar, and pipe) results in an increased risk of tooth loss over time.<sup>34</sup>

### Caries

Smokeless tobacco use is associated with increased caries (coronal and root) and cervical abrasions.<sup>35,36</sup> Smokeless tobacco contains a high level of sugar,<sup>37</sup> and is held in one area of the mucosa—typically adjacent to the facial/buccal

surfaces of the teeth. A recent study found a relationship between caries and the smoking of tobacco. Caries in 824 truck drivers was found to be significantly increased in cigarette smokers, with large cavities present in 14.6% of light smokers and 33% of heavy smokers (more than 10 cigarettes per day).<sup>38</sup> Tobacco use can be associated with xerostomia, thereby also increasing the risk of caries as well as reducing quality of life.<sup>39</sup>

### Oral Hygiene and Staining of the Dentition

In addition to an increased prevalence and incidence of oral conditions, tobacco users have poorer oral hygiene than do nonusers. One survey of 34,897 patients found that tobacco users brushed and flossed less frequently than did nonusers, with smokeless tobacco users having an especially low self-reported level of flossing and compliance with oral hygiene.<sup>40</sup> Smokers also have a poorer perception of their dental health than do nonsmokers.<sup>41</sup> Staining of the dentition, ranging from mild to heavy, is seen in smokers and in smokeless tobacco users (Figure 3).<sup>42</sup> This too is impacted by poor oral hygiene which, together with smoking (independent of the level of oral hygiene), are both associated with halitosis.

Figure 3. Tobacco staining of the dentition



Courtesy of Howard E. Strassler, DMD, FADM, FAGD, FACD

Table 2. Oral diseases and conditions impacted by tobacco use

• Leukoplakia	• Peri-implantitis	• Halitosis
• Oral cancer	• Abrasion of teeth	• Caries
• Periodontal disease	• Staining of teeth	• Loss of taste

### Environmental Smoke

The effects of environmental smoke (secondhand smoke) on cardiovascular and pulmonary health are well recognized; it is the leading cause of premature death after tobacco and alcohol use.<sup>43</sup> It also has been found to impact the oral health of exposed individuals. In a cross-sectional study, Arbes et al. found that exposure to environmental smoke (ES) resulted in an increased risk of periodontal disease,<sup>44</sup> and passive smoking in young children has been found to be associated with dental caries. Based on cross-sectional data from NHANES III for 3,531 children

between 4 and 11 years of age, in whom serum cotinine levels were measured as a proxy for ES and on whom dental examinations had been conducted, Aligne et al. found that ES was associated with an increase in the number of decayed and filled primary teeth. This association remained after adjusting for demographic factors, blood lead levels, and routine versus less-frequent dental care.<sup>45</sup> A second study also found increased caries related to ES,<sup>46</sup> while another suggested that ES may also be a risk factor for caries in adolescents.<sup>47</sup>

### The Biochemical and Genetic Response to Tobacco Exposure

The onset and progression of periodontal disease depends on a number of factors, and is determined by the host response, with lymphocytes, leucocytes, and the release of cytokines involved in this response. Research has uncovered a number of mechanisms by which tobacco may exert the observed negative influences on health, including genetic and host modification factors.

The migration of leukocytes and lymphocytes to the site of infection, as part of the normal host response, is regulated by adhesion molecules and ligands. Adhesion molecule dysregulation, reduced response of T-cells to antigens, altered neutrophil and monocyte activity, and platelet aggregation are some of the influences of smoking on the immune response.<sup>48,49,50,51</sup> Üstün et al. found that tobacco smoking significantly increases the volume of gingival crevicular fluid, and hypothesized that this may be a factor in the periodontal sequelae of smoking.<sup>52</sup> In other research, Sayers et al. found that nicotine could increase the negative effects of toxins released by periodontal bacteria, and concluded that this may be a mechanism involved in the increased severity of periodontal disease seen in smokers.<sup>53</sup> Interestingly, with respect to ES, Arredondo et al. found that these and pure nicotine were involved in altering immune response factors for periodontal disease.<sup>54</sup>

Lineberger et al. found that tobacco use induced genetic changes, specifically transcription of groups of genes involved in apoptosis (cell death) and proliferation of leukocytes, with repression of leukocyte apoptosis. They also concluded that transcriptional changes were probably responsible for the increased incidence of malignant lesions seen with tobacco use.<sup>55</sup> In other research, Meisel et al. found that while the influence of genetic polymorphisms that are risk factors for periodontal disease was negligible in nonsmokers, in smokers the influence of these genetic polymorphisms (including one for interleukin-1) was significant.<sup>56</sup> Tobacco metabolism is also influenced by genetics.<sup>57</sup> Tobacco carcinogens included N-nitrosamines, aromatic hydrocarbons, and aromatic amines.<sup>58</sup> Lam et al. researched *in vitro* free radical release—specifically nitric oxide—from smokeless tobacco extracts and demonstrated its direct release.<sup>59</sup>



## Prevalence of Tobacco Use

While regulations and public health campaigns have helped to reduce the prevalence of cigarette smoking, a significant percentage of the population still smokes tobacco or uses smokeless tobacco. Among adults 18 years of age and older, 19.8% smoke cigarettes (22.3% of men, 17.4% of women).<sup>60</sup> Education level is a significant factor—44% of people with GED diplomas smoke versus 6.2% of people with graduate degrees.<sup>61</sup> Current cigar smoking in 2007 was estimated to occur in 5.4% of the population age 12 and over.<sup>62</sup> With respect to teenage cigarette smoking, the Centers for Disease Control and Prevention (CDC) estimated that, in 2007, 20% of high school students were current smokers (21% male, 19% female) and 6% of middle school students were smokers.<sup>63</sup> Further, 2007 estimates for smokeless tobacco use indicated that about 13% of male and 2.3% of female high school students were users.<sup>64</sup> There is clearly a need to help users quit and stay abstinent from tobacco products.<sup>65</sup> Tobacco cessation results in short- and long-term benefits.

## Health Effects of Quitting Tobacco Use

After cessation of tobacco use, and with continued abstinence, the deleterious effects on oral and systemic health gradually diminish over time. Improvements in pulmonary function can be observed in less than 3 months; at 1 year, improvements in cardiovascular health can be seen, and by year 10, compared to smokers, there is a significantly reduced risk of cancers, with the risk for lung cancer decreasing 30% to 50%.<sup>66</sup> From social and sensory perspectives, short-term benefits include a reduction in bad breath and the tobacco smell on clothes and hair, and improved senses of taste and smell.

For oral health, the longer the individual has been abstinent, the lower the risk for periodontal disease and the lower the incidence of oral mucosal lesions.<sup>67,68</sup> Tobacco cessation may be associated with a relatively rapid improvement in periodontal status as well as lesion regression.<sup>69,70,71</sup> Former smokers can achieve a response to periodontal therapy and a healing response similar to that of nonsmokers,<sup>72,73</sup> and the elevated risk for tooth loss reduces over time.<sup>74</sup> A 10-year follow-up study (N = 12,212) of smokers and previous smokers found a significant reduction in the incidence of leukoplakia in patients who had ceased using tobacco. Other oral mucosal conditions, with the exception of lichen planus, also showed a reduced incidence in previous smokers compared with current smokers, including reductions in smoker's palate, central papillary atrophy of the tongue, and preleukoplakia.<sup>75</sup> The risk for oral and esophageal cancer is estimated to be halved after 5 years of abstinence from tobacco products,<sup>76</sup> and postmenopausal women who quit are also at reduced risk of a lower bone mass density compared to non-smokers. Other conditions and risk levels have also been found to improve following long-term abstinence from tobacco.<sup>77,78</sup>

The longer individuals have abstained from tobacco use, the lower the incidence of oral mucosal lesions and the lower the risk of periodontal disease.

## Tobacco Cessation in the Dental Office

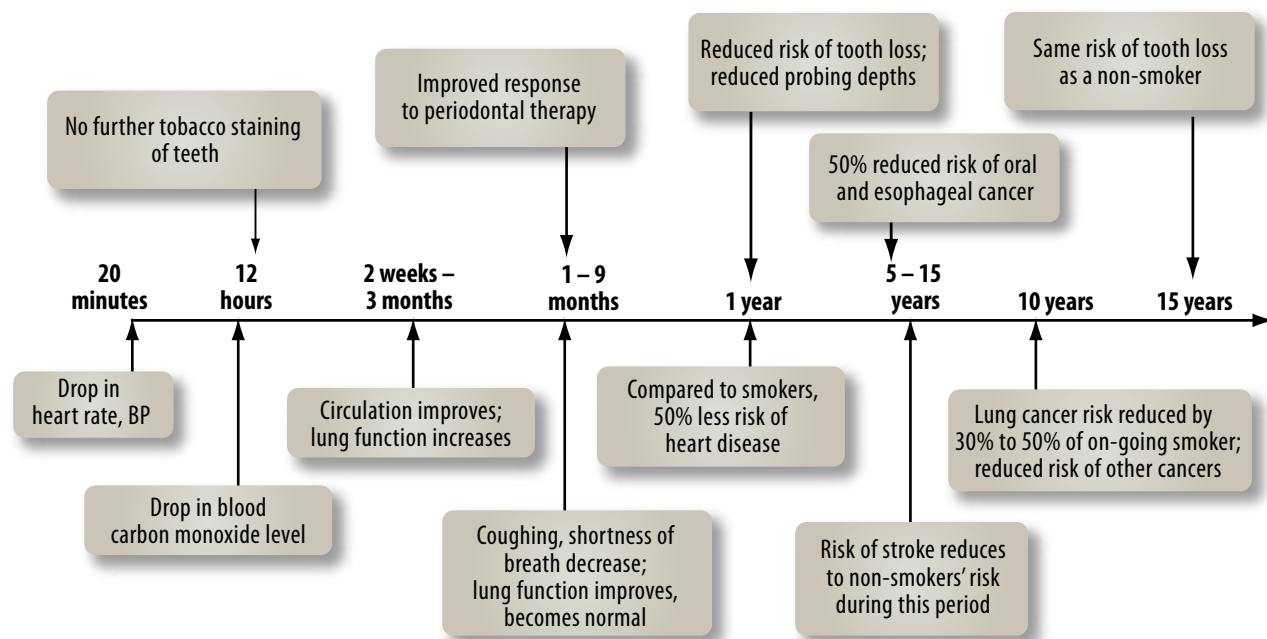
A number of surveys on tobacco cessation in relation to the dental office have variously assessed patient attitudes and needs, dental professional attitudes and needs, or both. In an academic-setting survey, the majority of patients believed that dental students should provide tobacco cessation advice to patients.<sup>79</sup> An Australian survey looked at barriers to providing smoking cessation services as well as the level of confidence of dentists and dental hygienists in providing these services. Respondents included 58 dental hygienists and 334 dentists, and while many advised patients to quit, they did not provide assistance or referral help. Short consultation times and lack of education and training emerged as barriers.<sup>80</sup> In a Canadian survey with 126 responding dental offices, 46% of offices reported asking patients about tobacco use and their interest in quitting, with 25% of offices helping patients to quit.<sup>81</sup> In a separate Canadian study with 514 respondents, 54.9% reported advising users to quit; 36.9% of respondents indicated they felt prepared to assist these patients.<sup>82</sup> In a UK survey, the cited barriers to providing these services were lack of time, lack of training, and lack of remuneration.<sup>83</sup> In a managed care setting with 184 dentists in 29 states in the United States, knowledge level was cited as a barrier.<sup>84</sup> In responses to a 2005 survey of dentists (N = 564) and hygienists (N = 676), oral cancer screening appeared to have been generally adopted but prevention services (counseling) were inadequate. The investigators again concluded that training was required and that dental professionals should be encouraged to offer these services.<sup>85</sup> A number of interesting conclusions emerged from a study by Campbell et al.:

1. 58.5% of patients (N = 3,088) believed that dental offices should provide tobacco cessation services.
2. 61.5% of dentists did not believe that patients expected this service.
3. Patients interested in quitting were more comfortable receiving advice to quit than were those who did not intend to quit (59.7% versus 39.4%).
4. Dentists perceived 2 main barriers to providing tobacco cessation services:
  - a. Patient resistance (94.3%)
  - b. Possibility of patients leaving the practice as a result (53.9%)

The authors concluded that “advising patients to quit is a professional responsibility.”<sup>86</sup>

Clinical practice guidelines sponsored by the US Public Health Service recommend that all health care providers include tobacco cessation counseling in routine practice.

Figure 4. Oral and systemic health: some benefits of quitting



## Tobacco Cessation Programs

Tobacco smoking is psychologically and physiologically addictive, while smokeless tobacco is physiologically addictive.<sup>87</sup> Tobacco cessation requires that patients be motivated to fight their addiction. Methods include referral to counseling and quit lines, stand-alone pharmacotherapeutic intervention, self-help materials (such as handouts, pamphlets, videos, and computer programs), school-based and community-based programs, and the use of the standard “5As” (see below).

### Effectiveness of Tobacco Cessation Programs in the Dental Office

A number of studies have researched the effectiveness of tobacco cessation services in dental offices. Brothwell conducted an evidence-based review of the literature and concluded that there was strong supporting evidence for their incorporation into dental patient care.<sup>88</sup> An outcomes analysis of a number of trials found that a 10% to 15% quit rate can be anticipated by incorporating an effective tobacco cessation program into the dental office.<sup>89</sup> Gordon et al. compared a program utilizing dental practitioner advice to quit, along with proactive telephone counseling versus the standard 5As (ask, advise, assess, assist, arrange follow-up) from Clinical Practice Guidelines in 2,177 tobacco users from 68 dental offices. Both programs resulted in a higher quit rate than did “usual care”; the 5As program resulted in the highest quit rate and was found to be the most applicable. In highly motivated patients, referral to a quit line for intensive counseling was effective.<sup>90</sup> A pilot study involving 8 dental offices and 82 patients found that patients benefited from referral to tobacco-use quit lines, which helped overcome time and resource constraints in the dental office. At 7 days, an abstinence rate of 25% was

reported for the group referred to the quit line versus 27% for the group receiving brief counseling.<sup>91</sup> A comparison of proactive and reactive quit line counseling across 48 randomized or quasi-randomized trials found that quit rates at 6 months were higher for groups receiving multiple callbacks. The results were superior to those of minimal intervention (i.e., standard self-help materials, a short session giving advice, or stand-alone pharmacotherapeutic treatment).<sup>92</sup> The use of chart reminders for the office and/or the presence of nicotine gum in the office can increase the time spent on counseling.<sup>93</sup>

## The 5As

Clinical Practice Guidelines recommend the use of the steps in the 5As. These steps are outlined below.

### Step 1. Asking

If patients indicate in their medical history that they use tobacco, ask what type of tobacco, frequency of use, amount, and times of day, and reasons for use; whether they have previously tried to quit, what they used, and how long they abstained. Adolescents may be reluctant to indicate tobacco use in writing; it helps to observe whether the patient smells of smoke (which may also be due to ES), has stained teeth, or other visible signs of tobacco use. Almost 90% of smokers become addicted by the age of 18 or earlier,<sup>94</sup> making this an important consideration. Asking about family members who smoke is important, given the impact of ES on health and the difficulty of trying to quit in a milieu where people smoke.

### Step 2. Advising

Educate patients on the risks of tobacco and benefits of quitting. Offer information—tobacco users want more in-

formation on reducing health risks.<sup>95</sup> One study found that only 6% of responding patients knew of an association with periodontitis.<sup>96</sup>

**Step 3. Assessing**

It is important to assess the patient’s motivation. Some patients will deny that their tobacco use is a problem, some will “want to quit” while others will want to “quit one day.” For unmotivated patients, the conversation should end in such a way that it is possible to bring up the topic again at a later date. For motivated patients, step 4 should be taken.

**Step 4. Assisting**

More than one-third of all smokers—39.8%—reported having tried to quit smoking within the previous year.<sup>97</sup> Going “cold turkey” is the least likely way to succeed; the majority of patients will need assistance to combat the physiological effects (withdrawal symptoms such as dizziness, headaches, and trouble sleeping) and psychological effects. Numerous cessation methods are currently available (Table 3). Others that have been tried but lack evidence include acupuncture and hypnosis.<sup>98</sup>

**Step 5: Arranging follow-up and support**

Follow-up appointments, information, and individual or group support all can play a role.

Dental prophylaxis at start of quitting may be a motivator by removing plaque, calculus and stain. A periodontal evaluation should also take place if this has not already occurred.

Table 3. Cessation methods

<b>Pharmacological intervention</b>
Nicotine replacement therapy (NRT)
OTC — patches, gums, lozenges
Rx — inhalers, nasal sprays
Non-NRT therapy
Rx — bupropion, varenicline
<b>Individual counseling</b>
<b>Pamphlets</b>
<b>Support groups</b>
<b>Internet support programs</b>

Considerations in individualizing a program include clinician and patient preferences, potential side effects, contraindications, and previous attempts to quit. Patients should be informed that lower tar and nicotine cigarettes, smokeless tobacco, hand-rolled cigarettes, and herbal/novelty smoking habits (such as bidis) are not safe alternatives—many believe the contrary to be true. Gain-framed messages (video and print) on the advantages of quitting have been found to be more effective than loss-framed messages, which remind the patient of the disadvantages of continuing to smoke.<sup>99</sup>

In one study, a brief intervention in smokeless tobacco users involved a routine examination with extra attention given to the site where wads were usually placed, discus-

sion on the health risks, viewing of a 9-minute video by the patient, and the provision of a self-help manual and brief counseling by the dental hygienist. It was found that this was effective for 3- and 12-month abstinence and resulted in a continued quit rate of 18.4% versus 12.5% for the control group.<sup>100</sup> An analysis of 66 tobacco cessation trials of adolescents revealed that these were effective with a mean quit rate at 3 months and 1 year of 12% versus 7% for the control group. The highest quit rates occurred when motivation enhancement and contingency-based reinforcement were included (19% and 16%, respectively). The success rate varied by vehicle. Classroom-based programs were best with a 17% quit rate, followed by computer-based programs and school-based clinics (13% and 12%, respectively).<sup>101</sup>

**Nicotine replacement therapy**

Nicotine replacement therapy (NRT) provides controlled doses of nicotine to relieve withdrawal symptoms, and can increase cessation rates by 150% to 200%. Patients should understand that it is other chemicals produced by tobacco that impact their health, not nicotine, to increase NRT acceptance and compliance. NRT is available as transdermal patches (Habitrol®, Nicoderm CQ®, Nicorette®), gum, and lozenges (Figure 5). Initial patient preferences in one study on NRT were inhaler (49%), gum (34%), tablet (10%), and nasal spray (7%).<sup>102</sup> One study of 2 NRT gums (Nicotinell® Mint coated chewing gum and Nicotinell Thrive Mint) found that these provided more of a toothwhitening effect than did a regular whitening chewing gum (V6 White Strong Mint, Fertin) and concluded that the associated removal of extrinsic stain could be motivating for patients trying to quit.<sup>103</sup> Lozenges containing nicotine bitartrate for NRT have also been found to be safe and effective in assisting with smoking cessation efforts, with statistically significant increases in continued abstinence compared with a placebo.<sup>104</sup> Binnie et al. conducted a study with dental hygienists that involved 116 patients (59 test and 57 control) and found that intervention using the 5As plus NRT resulted in a patient quit rate that, while modest, was double the quit rate over 6 months to 1 year compared with no intervention.<sup>105</sup> For heavy tobacco users (smokeless, > 3 cans per week), high-dose NRT may be required and high-dose nicotine patch therapy is tolerated well.<sup>106</sup> Long-term use of NRT may be necessary for highly addicted smokers to maintain tobacco abstinence.<sup>107</sup>

Figure 5. Nicotine replacement therapy



A systematic review of randomized trials of at least 6 months duration on self-help interventions found no support for adding self-help materials to nicotine replacement therapy and face-to-face advice. The reviewers also concluded that standard self-help materials might have a small effect compared with no intervention, nothing more.<sup>108</sup> In a review of 100 smokers who received counseling in the dental office, or counseling plus a 10-minute point-of-care saliva test that analyzed levels of nicotine metabolites, along with individualized feedback, a higher quit rate was obtained with the addition of the saliva test (23% versus 7%) and overall tobacco use was reduced by 68% versus 28%.<sup>109</sup>

### FDA-approved non-NRT medications

Bupropion (Zyban®, Glaxo-Smithkline), originally developed as an antidepressant, can double the cessation rate compared with no intervention or placebo.<sup>110,111,112</sup> Dale et al. found no significant differences at 24 weeks in quit rates between use of placebo or bupropion, but did find reduced cravings and lower weight gain in the bupropion group.<sup>113</sup> Bupropion can be used in combination with NRT, although there is insufficient evidence of an additive effect.<sup>114</sup> It is a sustained-release tablet taken twice daily and believed to work by reuptake inhibition of dopamine and noradrenalin. Side effects include insomnia, headache, dry mouth, and nausea. A 1 in 1,000 possibility of seizures has been reported.<sup>115</sup> Care must be taken when coprescribing with drugs that lower seizure threshold.<sup>116</sup>

Figure 6. Zyban and Chantix



Varenicline (Chantix®, Pfizer) has been shown to increase the 1-year quit rate 2- to 3-fold compared with no pharmacological intervention, and to result in a higher quit rate for smokers than obtained with bupropion.<sup>117,118</sup> It is a selective nicotinic receptor partial agonist that reduces the pleasure of smoking and helps reduce withdrawal symptoms. Quit rates at 1 year for varenicline, bupropion, and placebo in combination with weekly support counseling were 23%, 14.6%, and 10.3%, respectively, in a double-blind controlled clinical trial. The most common adverse event reported in a trial was nausea.<sup>119</sup> Wu et al. conducted a meta-analysis of randomized clinical trials using all 3 types of pharmacotherapies described above. Gum or patch reduced smoking at 3 months. Varenicline was found in indirect comparisons to be superior to placebo at 3 months and 1 year, and superior to nicotine replacement therapy. Bupropion has also been found to be superior to nicotine replacement therapy, and varenicline to bupropion, at 1 year.<sup>120</sup> Varenicline and

bupropion have not been studied in children and are approved for use in adults 18 and older.

Suggestions for individualized pharmacotherapeutic intervention, resulting from a consensus meeting with 37 international experts, were recently published. In addition to consensus on the use of NRT, bupropion, and varenicline as “first-line therapy,” the consensus was that the evidence, individual patient experience and preference, the patient’s dependence on tobacco and history of failed attempts, frequency of monitoring, contraindications and comorbidities should be considered when prescribing pharmacotherapeutics. Combinations of medications that were considered at the meeting included 2 or more forms of NRT (e.g., patch and gum; patch and inhaler; patch and lozenge) and use of bupropion and 1 NRT.<sup>121</sup>

It is important to note that in July 2009 the FDA issued a statement requiring the manufacturers of varenicline and bupropion to place boxed warnings on these drugs and to develop patient Medication Guides highlighting the risk of patients experiencing neuropsychiatric symptoms that can include hostility, agitation, changes in behavior, depressed moods, suicidal thoughts, and attempted suicide, which were reported post-marketing. Patients receiving these drugs must be closely monitored for these symptoms.<sup>122,123</sup>

### General considerations

It is outside the scope of this article to address all dosages, side effects, and contraindications for pharmacologic interventions. These can be found in the prescribing information for the respective product. FDA-approved and OTC tobacco cessation drugs may be recommended and prescribed in the dental office in accordance with the Scope of Practice. To determine the Scope of Practice for the state in which you practice, the clinician should check with his or her State Dental Board. As is the case with any drug, the clinician requires a full medical history, and must also know how to effectively and safely administer the intervention program and be able to monitor the patient if the patient is treated. As an alternative, individual patients can be advised and aided with non-pharmaceutical interventions and/or referred to their physician or a specialist for treatment. The ADA CDT code for such programs is D1320 (“Tobacco counseling for the control and prevention of oral disease”). Patients should be aware that this may not be covered by their insurance programs.

### Professional Dental Care

Routine dental care must consider the individual patient; this applies to tobacco users, previous users, and nonusers alike. Considerations include oral cancer screening, oral mucosal lesions, periodontal care, and preventive care.

Oral cancer screening should be performed during the routine dental examination and should begin with a visual examination and palpation intraorally and extraorally of the head and neck. Adjunctive devices used for oral cancer



screening can aid lesion identification. Regular oral cancer screening is important for all adult patients, not just smokers. With respect to periodontal disease, smokers are less likely to respond to standard periodontal therapy and may be candidates for systemic or locally applied antimicrobial therapy. Patients should be advised to quit tobacco use. In addition, patients who are candidates for implant therapy should be advised to quit prior to implant surgery in order to improve the likelihood of successful implant therapy and the long-term health of the peri-implant tissues.

Tobacco users may experience xerostomia, and both bupropion and varenicline can be associated with xerostomia in some patients. Consideration can be given to preventive therapy that could include in-office topical fluoride therapy (fluoride varnish or gel) and home use of prescription-level fluorides or dental cream containing casein phosphopeptide-amorphous calcium phosphate (Recaldent™). Chewing gum containing Recaldent™ (Trident Xtra Care™, Cadbury Adams) has been shown to help reduce demineralization and increase remineralization and stimulates salivary flow. Other options include the use of xylitol chewing gum, which reduces the bacterial load. For smokers in the process of quitting, the physical activity of chewing the gum may help substitute for the activity of smoking in addition to stimulating saliva.

### Aphthous Ulcers

In patients who are in the process of quitting, there can be an increased incidence of aphthous ulcers (which are less common in smokers than in nonsmokers). It is believed that the hyperkeratinization present in the oral mucosa of smokers protects the mucosal surface against aphthous ulceration. The presence or increase of aphthous ulcers can be a negative motivation and it is important that the patient be provided with support and palliative care to manage this potential side effect of quitting. Palliative care can include the use of locally applied creams and pastes (Orajel®, Colgate Orabase®, Anbesol®, Aphthasol®), octylcyanoacrylate liquid that is locally applied to form a protective barrier for aphthous ulcers, and, if ulcers are more widespread, the use of bioadhesive rinses that provide relief (Rincinol™, Gelclair®). In addition to providing pharmacotherapy for tobacco cessation, NRT reduces the occurrence of aphthous ulcers.<sup>124</sup>

### Conclusions

Interventions by the dental team can increase quit and abstinence rates. Dental clinicians are in a unique position to educate and motivate patients concerning the dangers of tobacco to their oral and systemic health, and to provide or recommend intervention programs as part of routine patient care.

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## Resources

American Dental Association ([www.ada.org](http://www.ada.org))  
Centers for Disease Control and Prevention, Office on Smoking & Health ([www.cdc.gov/tobacco](http://www.cdc.gov/tobacco))  
American Cancer Society ([www.cancer.org](http://www.cancer.org))  
National Cancer Institute, Cancer Information Service ([www.cancer.gov](http://www.cancer.gov))  
American Heart Association ([www.amhrt.org](http://www.amhrt.org))  
American Lung Association ([www.lungusa.org](http://www.lungusa.org))  
[www.chewfree.com](http://www.chewfree.com)  
My Last Dip ([www.mylastdip.com](http://www.mylastdip.com))  
[www.smokefree.gov](http://www.smokefree.gov)  
Spit Tobacco: A Guide for Quitting ([www.nidcr.nih.gov](http://www.nidcr.nih.gov))  
[www.quitplan.com](http://www.quitplan.com)  
The Campaign for Tobacco-Free Kids ([www.tobaccofreekids.org](http://www.tobaccofreekids.org))

## Author Profile



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Dr. Fiona M. Collins has authored and presented CE courses to dental professionals and students in the US and internationally, and has been an active consultant in the dental industry for several years. Dr. Collins is a member of the American Dental Association and the Organization for Asepsis and Safety Procedures, and has been a member of the British Dental Association, Dutch Dental Association, the International Association for Dental Research and the Academy of General Dentistry Foundation Strategy Board. Dr. Collins earned her dental degree from Glasgow University and holds an MBA and MA from Boston University.

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## Questions

- Both smoking tobacco and smokeless tobacco impact systemic and oral health.
  - True
  - False
- Tobacco smokers and heavy smokeless tobacco users have both been found to be more than twice as likely as nonusers to suffer from hypercholesterolemia.
  - True
  - False
- Tobacco use is associated with decreases in C-reactive protein levels.
  - True
  - False
- Cigarette smoking is responsible for about \_\_\_\_\_ of all deaths in the United States each year.
  - 10%
  - 20%
  - 30%
  - 40%
- Smokers experience more periodontitis and more severe periodontitis than do nonsmokers.
  - True
  - False
- Oral cancer risk for smokers is at least \_\_\_\_\_ times higher than for nonsmokers, and for chew/spit tobacco users the risk of cancer of the cheek and gingivae has been found to increase \_\_\_\_\_ over that of nonusers.
  - 2; 10-fold
  - 4; 30-fold
  - 6; 50-fold
  - 8; 70-fold
- Smoking tobacco, but not smokeless tobacco, is associated with increased caries and cervical abrasions.
  - True
  - False
- Exposure to environmental smoke increases the risk of several conditions, including \_\_\_\_\_.
  - heart and pulmonary diseases
  - periodontal disease
  - caries
  - all of the above
- Tobacco smoking has been found to \_\_\_\_\_.
  - increase the volume of gingival crevicular fluid
  - induce genetic changes
  - increase the influence of genetic polymorphisms
  - all of the above
- Nicotine could increase the negative effects of toxins released by periodontal bacteria.
  - True
  - False
- The use of smokeless tobacco among high school students is extremely rare.
  - True
  - False
- Among adults 18 years of age and older, \_\_\_\_\_ of men and \_\_\_\_\_ of women smoke cigarettes.
  - 18.3%; 13.4%
  - 20.5%; 15.6%
  - 22.3%; 17.4%
  - 24.4%; 19.2%
- Improvements in pulmonary function following tobacco cessation can be observed only after three years.
  - True
  - False
- Tobacco cessation may be associated with a relatively rapid improvement in periodontal status as well as oral mucosal lesion regression.
  - True
  - False
- The risk for oral and esophageal cancer is estimated to be \_\_\_\_\_ after 5 years of abstinence from tobacco products.
  - reduced by one third
  - reduced by half
  - reduced by two-thirds
  - none of the above
- Postmenopausal women who quit tobacco use are at reduced risk of a lower bone mass density compared to non-smokers.
  - True
  - False
- \_\_\_\_\_ has emerged as a barrier to tobacco cessation services in the dental office setting.
  - Short consultation times
  - Lack of education and training
  - Lack of remuneration
  - all of the above
- Campbell et al. found that while patients believed that dental offices should offer tobacco cessation services in the dental office setting, more than half of dental clinicians surveyed did not believe this to be the case.
  - True
  - False
- Tobacco smoking and use of smokeless tobacco are both physiologically addictive.
  - True
  - False
- An outcomes analysis of a number of trials found that a \_\_\_\_\_ quit rate can be anticipated by incorporating an effective tobacco cessation program into the dental office.
  - 5% to 10%
  - 10% to 15%
  - 15% to 20%
  - none of the above
- The standard 5As, which have been found to be effective, stands for 'ask, advise, assess, assist, arrange follow-up'.
  - True
  - False
- An analysis of 66 tobacco cessation trials in adolescents revealed that these were effective with a mean quit rate at 3 months and 1 year of 12% versus 7% for the control group.
  - True
  - False
- Nicotine replacement therapy (NRT) provides controlled doses of nicotine to relieve withdrawal symptoms, and can increase cessation rates by 150% to 200%.
  - True
  - False
- In one study of chewing gums, the researchers concluded that the toothwhitening effect of an NRT gum could be a motivator for patients.
  - True
  - False
- Long-term use of NRT may be necessary for highly addicted smokers to maintain tobacco abstinence.
  - True
  - False
- Bupropion, originally developed as an antidepressant, can double the cessation rate compared with no intervention or placebo and varenicline has been found to increase the quit rate two- to three-fold.
  - True
  - False
- Patients taking bupropion or varenicline are at risk for neuropsychiatric symptoms.
  - True
  - False
- Individual patients can be advised and aided with non-pharmaceutical interventions and/or referred to their physician or a specialist for treatment.
  - True
  - False
- In addition to providing pharmacotherapy for tobacco cessation, NRT reduces the likelihood of ulcers occurring.
  - True
  - False
- Dental clinicians are in a unique position to educate and motivate patients concerning the dangers of tobacco to their oral and systemic health, and to provide or recommend intervention programs as part of routine patient care.
  - True
  - False

# Tobacco Cessation and the Impact of Tobacco Use on Oral Health

Name:	Title:	Specialty:
Address:	E-mail:	
City:	State:	ZIP: Country:
Telephone: Home (     )	Office (     )	Lic. Renewal Date:

Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 4 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp. **For Questions Call 216.398.7822**

## Educational Objectives

- List the types of tobacco and prevalence of use in the US population
- Know the impact of tobacco use on oral and systemic health
- Understand the biochemical and genetic factors associated with tobacco's impact on oral health
- State the methods that can be recommended and that patients can engage in for tobacco cessation

## Course Evaluation

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?	Objective #1: Yes No		Objective #3: Yes No			
	Objective #2: Yes No		Objective #4: Yes No			
2. To what extent were the course objectives accomplished overall?	5	4	3	2	1	0
3. Please rate your personal mastery of the course objectives.	5	4	3	2	1	0
4. How would you rate the objectives and educational methods?	5	4	3	2	1	0
5. How do you rate the author's grasp of the topic?	5	4	3	2	1	0
6. Please rate the instructor's effectiveness.	5	4	3	2	1	0
7. Was the overall administration of the course effective?	5	4	3	2	1	0
8. Do you feel that the references were adequate?		Yes		No		
9. Would you participate in a similar program on a different topic?		Yes		No		
10. If any of the continuing education questions were unclear or ambiguous, please list them.						

11. Was there any subject matter you found confusing? Please describe.

12. What additional continuing dental education topics would you like to see?

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**Academy of Dental Therapeutics and Stomatology,**  
 A Division of PennWell Corp.

P.O. Box 116, Chesterland, OH 44026  
 or fax to: (440) 845-3447

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**(Checks and credit cards are accepted.)**

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| 12. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 27. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 13. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 28. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
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AGD Code 157, 130

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